

moved about a quarter of a century ago by the creation of a professorship of naval architecture in the University of Glasgow, thanks to the generosity of Mrs. John Elder. About the same time a professorship of engineering was established in connection with the University of Durham at the College of Science (now the Armstrong College), Newcastle-on-Tyne, and instruction in naval architecture is included in the curriculum of studies in this department. It was always desired to have an independent professorship of naval architecture in this great centre of shipbuilding, and by persistent effort this desire was fulfilled about a year ago. The country now possesses three schools of naval architecture, two of which are independent of the Admiralty, and sustained by the private shipbuilding industry.

It has been suggested that the multiplication of schools of naval architecture in Great Britain may be overdone, but when compared with the provision now made for the education of naval architects in Germany, France, and the United States, and taking into account the overwhelming preponderance of British shipowning and shipbuilding, there need be no fear that four schools of naval architecture, each with a considerable number of students, would constitute an excessive provision for this country. In the Technical High School of Charlottenburg, near Berlin, there were not long ago about 400 students of naval architecture and marine engineering, all of whom had received adequate preparatory training before entering the high school and specialising in these studies. Even at the present time the total number of equally qualified students of naval architecture and marine engineering attending the classes in British schools is only about 170, or less than one-half the number of men studying at Charlottenburg. In the United States excellent schools of naval architecture exist at the Massachusetts Institute of Technology and as departments in several universities. These are well equipped, and attended by considerable numbers of students. When it is borne in mind that the aggregate tonnage of steamships belonging to the British Empire is seventeen millions of tons, as against 3,705,000 tons owned by Germany and 1,542,000 (exclusive of the shipping on the great lakes) owned by the United States, and that in 1907 the gross tonnage of ships launched in the United Kingdom aggregated 1,608,000 tons, as against 291,000 tons for Germany and 486,300 tons for the United States, it will hardly be maintained that the provision made or contemplated for the higher education of British naval architects is likely to prove excessive.

Possibly it may be thought that the German provision for such education is extravagantly large, and that the number of highly trained men who annually pass out from the High School at Charlottenburg is in excess of the real requirements of the shipbuilding industry of that country. This is not the opinion entertained in Germany itself, for another school of naval architecture has been created at Dantzig recently.

The last half-century has witnessed unprecedented progress in British shipping and shipbuilding. It is apt to be forgotten that when the Civil War broke out the tonnage of American shipping was rapidly overtaking that of this country, and threatened to surpass it before long. It is true, no doubt, that the lead which we took in the use of iron instead of wood as the chief material of construction, and in the development of steam navigation, helped forward the remarkable progress that has been made. It is equally true that great assistance to progress has been given by the application of scientific methods to ship construction and propulsion. It would be ridiculous to suppose that the contemporaneous development of technical and scientific training amongst naval architects and marine engineers had only been a coincidence, and had not played a great part. Many circumstances, as well as many persons, have assisted in bringing British shipping and shipbuilding into its present unrivalled condition, but the underlying and predominant cause must be found in the general recognition of the necessity for scientific as well as practical training on the part of those engaged in the design and construction of ships and their machinery.

Ship-designing can never be dealt with on purely scientific methods. Exact estimates cannot be made of the

most trying conditions to which ships at sea may be subjected. Accumulated experience, based on careful observation and experiment, must always be the foundation of successful work. Direct experiments on models of ships and propellers are of incalculable value; but the arrangement and conduct of these experiments, the carrying out of observations on the behaviour of ships, the grouping and analysis of results, and the deduction therefrom of facts and principles for future guidance, all demand scientific knowledge and scientific procedure. Of course, this is not peculiar to shipbuilding, and I have no desire to magnify the importance of that branch of engineering to which my life has been devoted. It is equally true of engineering as a whole, and of the applications of science to industrial processes generally. My chief object in describing to-night what has been done in the technical education of naval architects has been to present an object-lesson to those interested in technical education as a whole.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Prof. Adam Sedgwick, president of the Philosophical Society, has been appointed to represent the society at the Darwin centenary celebrations in June, 1909.

In a letter to the Vice-Chancellor, the secretaries of the Royal Society announce that, as Sir William Huggins desires now to relinquish the care of the stellar spectroscopic equipment placed in his hands by the Royal Society in 1871, the president and council of the society are prepared to present these instruments as a gift towards the equipment of the astrophysical department of the Cambridge Observatory, subject to an assurance of their permanent profitable employment being obtained. This assurance having been given by the observatory syndicate, the installation will be transferred permanently to the University as it now stands in full working order in Sir William Huggins's observatory. In view of the historical importance of this equipment, and its intimate connection with the foundation and development of the science of astrophysics, it is desired that the name of Sir William Huggins be permanently connected with the instruments.

The electors to the Isaac Newton studentships give notice that, in accordance with the regulations, an election to a studentship will be held in the Lent term, 1909. These studentships are for the encouragement of study and research in astronomy and physical optics. The persons eligible are members of the University who have been admitted to the degree of Bachelor of Arts, and who will be under the age of twenty-five years on the first day of January, 1909. It will be the duty of the student to devote himself during the tenure of his studentship to study or research in some branch of astronomy or physical optics. The student's course of study or research must be, as a rule, pursued at Cambridge. The studentship will be tenable for the term of three years from April 15, 1909. The emolument of the student will be 200*l.* per annum, provided that the income of the fund is capable of bearing such charge.

LONDON.—The new deans of faculties are:—for medicine, Prof. S. H. C. Martin, F.R.S.; for science, Prof. J. M. Thomson, F.R.S.; for engineering, Prof. W. E. Dalby.

Prof. T. G. Brodie has resigned his post as professor-superintendent of the Brown Animal Sanatory Institution on his appointment as professor of physiology in the University of Toronto.

The degree of D.Sc. in physiology has been granted to Dr. F. H. Scott, an internal student, of University College, who submitted a thesis entitled "On the Relative Parts played by Nervous and Chemical Factors in the Regulation of Respiration," and other papers; also to Dr. H. W. Bywaters, an internal student, of the physiological laboratory of the University, who submitted a thesis entitled "An Inquiry into the Chemical Mechanism concerning the Absorption of Protein and Carbohydrate Food," and other papers.

A separate board of studies is to be constituted for ethnology.

THE council of the University College, Bristol, has appointed Dr. John Beddoe, F.R.S., honorary professor of anthropology.

DR. V. H. BLACKMAN, professor of botany in the University of Leeds, has been appointed by the Senate to represent the University at the commemoration, in June next, at the University of Cambridge, of the centenary of Darwin's birth and the fiftieth anniversary of the publication of the "Origin of Species."

LORD IVEAGH has been elected Chancellor of the University of Dublin in succession to the late Lord Rosse. Lord Iveagh has been a generous benefactor of the University, and contributed a sum of 16,500*l.* for the construction and equipment of the laboratory of experimental physics, which was completed in 1906.

SPEAKING at Edinburgh on November 19, in opening the new science and art rooms of George Watson's College for Boys, Lord Avebury said that, considering how much we owe to science, it is a marvel that so little time is devoted to the study of nature in the public-school and university system. Scientific men do not undervalue or wish to exclude classics from the curriculum, but their point of view is that a man, however much he may know of the dead languages, if he knows nothing of science is but a half-educated man after all.

AN article by Prof. Rudolf Tombo, jun., in *Science* for October 30 last, on the geographical distribution of the student body at a number of American universities and colleges, deals incidentally with the number of foreign students in attendance at these institutions. The total number of students from foreign countries in attendance at the twenty-seven institutions in the United States selected for the purposes of the comparison is 1088. Of this number Europe contributes 219, Asia 332, Australasia 58, and Africa 9. Pennsylvania University has the largest foreign clientele, followed by Columbia, Cornell, and Harvard, each of which attracts more than one hundred foreigners. Taking the representation of foreigners at all the selected institutions, we find that the largest number of students are sent by the following countries:—Canada, 210; Japan, 142; China, 139; Mexico, 90; Cuba, 67; Great Britain and Ireland, 60; Argentine Republic, 56; and India, 54. Of European countries, England sends the largest number, namely, 60, followed by Russia with 40 and Germany with 32. Of the students from Great Britain and Ireland, 8 attend Columbia University, 9 Harvard, and 12 Pennsylvania.

THE opening of the new memorial buildings at Eton College by the King took place on Wednesday, November 18. The ceremony was most impressive, and the King's reply to the address of the boys expressed in admirably clear and dignified words the feelings which must have pervaded the whole assembly. "You all have the opportunity of leaving Eton trained in the knowledge and accomplishments of English gentlemen, and disciplined to the self-restraint, the consideration for others, and the loyal acceptance of private and public duties which are the ideals of our race. I exhort you to value and make the most of that training and discipline. You can have no better example than that of the brave men of whom this splendid building is a loyal and lasting memorial." It would be difficult to give a better expression to the public-school ideal, and the King's words may well be studied by every school in his kingdom. Eton has for some time possessed laboratories, chemical, physical, and biological, as well as workshops, and, as at other public schools, boys have the opportunity of acquiring some of the wider culture which science is ready to supply, and which Osborne and Dartmouth are adding to the knowledge and accomplishments of English princes; but hitherto Eton has had no single building capable of accommodating the whole school. The new hall supplies this defect, and it will be used for concerts and lectures, provision having been made for an electric lantern. The acoustic properties of the hall seem to be excellent, and every word, not only of the King's speeches, but also of the address read by the captain of the school, was distinctly audible. Adjoining the hall is a dome, in which the school library will find adequate accommodation.

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THE annual report of the Glasgow and West of Scotland Technical College, adopted by the governors of the college at the end of September last, has reached us. There was during the session 1907-8 an increase of 156 students, bringing the total up to 5918 individuals if, as is done in the report, the pupils of Allan Glen's School are included. We observe that the completion of the long-contemplated amalgamation of the Incorporated Weaving, Dyeing, and Printing College with the Technical College has been effected, and this department, like all the other departments of the college, will continue under the supervision of leading members of the industry with which the work is associated. A condition of the amalgamation is that the governors shall make their best endeavours to provide new premises for the weaving department in the new buildings. Efforts are to be made to improve the preliminary education of students entering the college; notice has been given that in September, 1910, the standard of the preliminary examination will be raised to that of the leaving certificate of the Scotch Education Department. As the report points out, there is no reason why a boy of average capacity and diligence should not obtain this certificate at the age of seventeen or eighteen. The report acknowledges the encouragement received by the college from the Carnegie Trust for the Universities of Scotland by a grant of 4000*l.*, from the Education Department by an additional grant of 880*l.* towards the building and equipment fund, from the Corporation of Glasgow of a sum of 4500*l.* from the residue grant, and also 900*l.* in respect of the weaving college, and from local associations, industrial firms, and others by gifts of prizes for students and of material for use in the laboratories.

THE report on the work of the department of technology of the City and Guilds of London Institute for the session 1907-8 has reached us. We notice that since the institute, some sixteen years ago, first established classes for the training of teachers in the use of wood-working and metal-working tools, instruction in this subject has made great advances, and has been very much improved. Originally introduced by way of experiment in a few elementary schools, manual training is now a recognised subject in the curriculum of most elementary and secondary schools, and is one of the subjects studied by men students in training colleges for teachers in elementary schools. A recent alteration in the Board of Education Code regulating the work of public elementary schools, by which boys of eleven years of age are admitted to classes in handicrafts, will result most probably in a further demand for qualified teachers in these subjects. The technology committee of the institute directs attention to the fact that the Board of Education has under consideration the question of developing all forms of manual instruction and of encouraging continuity throughout such teaching from the classes for infants to the upper standards of the elementary school. Since 1892, the date of the first public examination, 4861 teachers' certificates in manual training have been awarded by the institute. The work of the department as a whole continues to progress. The number of subjects in which examinations were held during the year dealt with in the report was seventy-two, as compared with sixty-nine in the previous year, the number of separate classes increased from 3311 to 3604, and the number of students in attendance from 46,048 to 48,223. The programme of courses of instruction for the current year contains, the report states, seventy-six different syllabuses, including courses of instruction relating to more than a hundred distinct branches of industry.

PART II. of vol. i. of the *Journal of the Municipal School of Technology, Manchester*—a record of the work of the school—has just been issued. It consists of 130 pages of reprints of ten papers written by members of the staff of the school, and communicated to the scientific societies or published in the scientific Press during the four years 1903-7. One of the papers deals with a mathematical, another with an electrical, a third with a sanitary, two with engineering, and five with chemical questions. The journal is printed in the school, and reflects great credit on the printing department. Its issue raises several momentous questions. In the first place, Manchester appears to be the only technical school in this country

which considers it worth its while to reprint the papers written by the members of its staff, and the conclusion is forced on us that no one of the dozen polytechnics of London or of the score of technical schools in the large towns of the provinces—Birmingham, Glasgow, Belfast, and others—contributes to the advancement of science so much as Manchester does. In the next place, it may reasonably be asked, Is Manchester doing as much as it ought to do in this direction? To answer this question we must remember that the school cost a third of a million, has a staff of nearly 100, and claims to be second to none in the kingdom in point of equipment. Judging by Continental schools, about one-sixth of the staff might reasonably be expected to be doing something to solve the problems met with in their own departments, and on this basis Manchester does not yet produce its proper quota of research; and if Manchester does not, what must be the state of the other schools of the kingdom? and why are they in this state? They were founded for the training of those who intend to apply science to industry, who can render no greater service to industry than the solution of some of its problems. What better training for this purpose can there be than working out one of those problems under the guidance of a teacher, and how can the teachers act as guides unless they themselves have been pioneers? No technical school is fulfilling its highest purpose when its staff is not carrying out research, but is merely retailing text-book knowledge which, from the nature of things, must be a dozen years behind the times. Yet how many of the schools of the kingdom are content to do nothing better than point to their records of how many thousand students have passed through them, and probably learnt nothing more up-to-date than Euclid or the atomic theory, both of which they might have learnt just as well in any primary school?

THE seventh annual meeting of the North of England Education Conference is to be held on January 7, 8, and 9, 1909. United conferences are to be held in the Manchester Town Hall on the mornings of January 8 and 9, and sectional meetings at the Manchester Municipal School of Technology in the afternoons of the same days. One of the subjects for discussion in the sectional meetings of the second day of the conference is the training of girls in domestic subjects, concerning which papers are to be read by Miss Alice Ravenhill and Miss E. J. Ross. The united conference on the concluding day is for the discussion of the coordination of the curricula in primary and secondary schools, and papers are to be read by Messrs. J. L. Paton and J. W. Iliffe and Miss Isabel Cleghorn. The following subjects are to be considered in sectional meetings on the last day of the conference:—the place of the higher elementary school in the scheme of education, with papers read by Mr. C. H. Wyatt and Prof. J. J. Findlay; the relation of the universities to evening teaching in industrial centres; papers by Messrs. R. H. Tawney and W. J. Bees; and methods of teaching mathematics; papers by Messrs. T. J. Garstang and H. Brotherton. The committee has deemed it desirable to ask delegates to pay a membership subscription of one shilling, which will contribute in some measure towards the expense involved. Admission to the conference meetings will be by ticket, application for which should be made to the honorary secretaries at the Manchester Municipal School of Technology, accompanied by a postal order or stamps for one shilling as membership subscription in respect of each person attending the conference. The committee has arranged to display the Manchester Education Committee's exhibit as shown at the recent Franco-British Exhibition. It is designed to show the complete and varied educational work of a large county borough, and will be set up in the examination hall of the Municipal School of Technology. A comprehensive exhibition of educational apparatus and books will also be arranged.

For more than a year a committee, composed of representatives of the University of Oxford, on the one hand, and of labour representatives on the other, has been considering the question of the relation between the University of Oxford and the education of working men. It

is expected that the report of the deliberations of the committee will be published shortly. In connection with the same movement a conference, largely attended by delegates of trades unions and other organisations of working men, was held on November 21 at Teynbee Hall. The scheme to be recommended by the Oxford committee in the forthcoming report was described by the joint secretary. The Bishop of Birmingham delivered an address, during the course of which he said it appears to him to be beyond the possibility of question that the proportion of young men who are at Oxford because it is "the right thing" to go to Oxford and because they want to have a good time is ridiculously great. No serious person can think about Oxford without seeing that this is a gross misappropriation of the purposes and resources of the University, and that, by one means or another, it requires fundamental alteration. A system is to be desired in which it shall be understood clearly, and effectively brought about, that persons who do not at once show that they come to the University because they want to be students will have to go elsewhere. If carried out there would be a great displacement of well-to-do young men who want to have a good time by serious students who would come equally from all classes, but in large measure from among the workers. There is in most classes a body of people who want to be serious students, and possess the requisite qualifications. These persons have the right to be at the University, because it exists for such students. The endowments of the place should be so re-arranged as really to be again applicable to the ends for which they were first given, namely, to enable those who have no means of their own, but have the capacity and desire to be students, to avail themselves of the resources and the opportunities of the great centres of learning. Then would follow a re-modelling in the University of the whole scale and standard of living.

SOCIETIES AND ACADEMIES.

LONDON.

Challenger Society, October 28.—Mr. A. E. Shipley, F.R.S., in the chair.—Ostracoda of the Bay of Biscay captured during the 1900 cruise of H.M.S. *Research*: Dr. G. H. **Fowler**. More than 7000 specimens had been identified, and in the case of more than 3000 the sex had been determined and the length of the shell measured. As the result of these measurements the author was enabled to formulate provisionally a new law of growth in Crustacea:—"during early growth each stage increases at each moult by a fixed percentage of its length which is constant for the species and sex"; for this the name of Brooks's law was suggested, Prof. W. K. Brooks having made the first observations which led to it; it had been checked to some extent by observations on lobsters (Herrick) and crabs (Waddington). In several cases it was shown that two stages of the same species had been described as different species. Twenty-five species occurred in the collection, and in some cases as many as five stages had been recognised. As regards the vertical distribution, attention was directed to an increase in the number of specimens captured between 750–400 fathoms as compared with those from 400–100 fathoms, and the suggestion made that this was due to a check in the velocity of fall of dead and dying specimens, produced by the increased viscosity of the water, which in its turn was dependent on increased pressure and diminished temperature. All the four plentiful species, which were recognised on other grounds as mesoplanktonic, attained their maximum intensity in this zone, which would constitute a rich food-zone. Three species were apparently purely mesoplanktonic; eleven reached their maximum intensity in or near the epipelagial, but extended into the mesoplankton, and of these eleven three were apparently purely mesoplanktonic at their oldest stage; four were purely mesoplanktonic. The question of the vertical oscillation of the species was discussed, and several were shown to be more abundant in the epipelagial by night than by day; in one case an attempt was made to trace the movement of the species at different times of day. The proportion of males to females seemed to point to the probability that one species was parthenogenetic.